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3D Imaging of Density Gradients Using Plenoptic BOS JENNA KLEMKOWSKY, CHRIS CLIFFORD, TIMOTHY FAHRINGER, BRIAN THUROW, Auburn University — The combination of background oriented schlieren (BOS) and a plenoptic camera, termed Plenoptic BOS, is explored through two proof-of-concept experiments. The motivation of this work is to provide a 3D technique capable of observing density disturbances. BOS uses the relationship between density and refractive index gradients to observe an apparent shift in a patterned background through image comparison. Conventional BOS systems acquire a single line-of-sight measurement, and require complex configurations to obtain 3D measurements, which are not always conducive to experimental facilities. Plenoptic BOS exploits the plenoptic camera's ability to generate multiple perspective views and refocused images from a single raw plenoptic image during post processing. Using such capabilities, with regards to BOS, provides multiple line-of-sight measurements of density disturbances, which can be collectively used to generate refocused BOS images. Such refocused images allow the position of density disturbances to be qualitatively and quantitatively determined. The image that provides the sharpest density gradient signature corresponds to a specific depth. These results offer motivation to advance Plenoptic BOS with an ultimate goal of reconstructing a 3D density field.

Jenna Klemkowsky
Auburn University

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